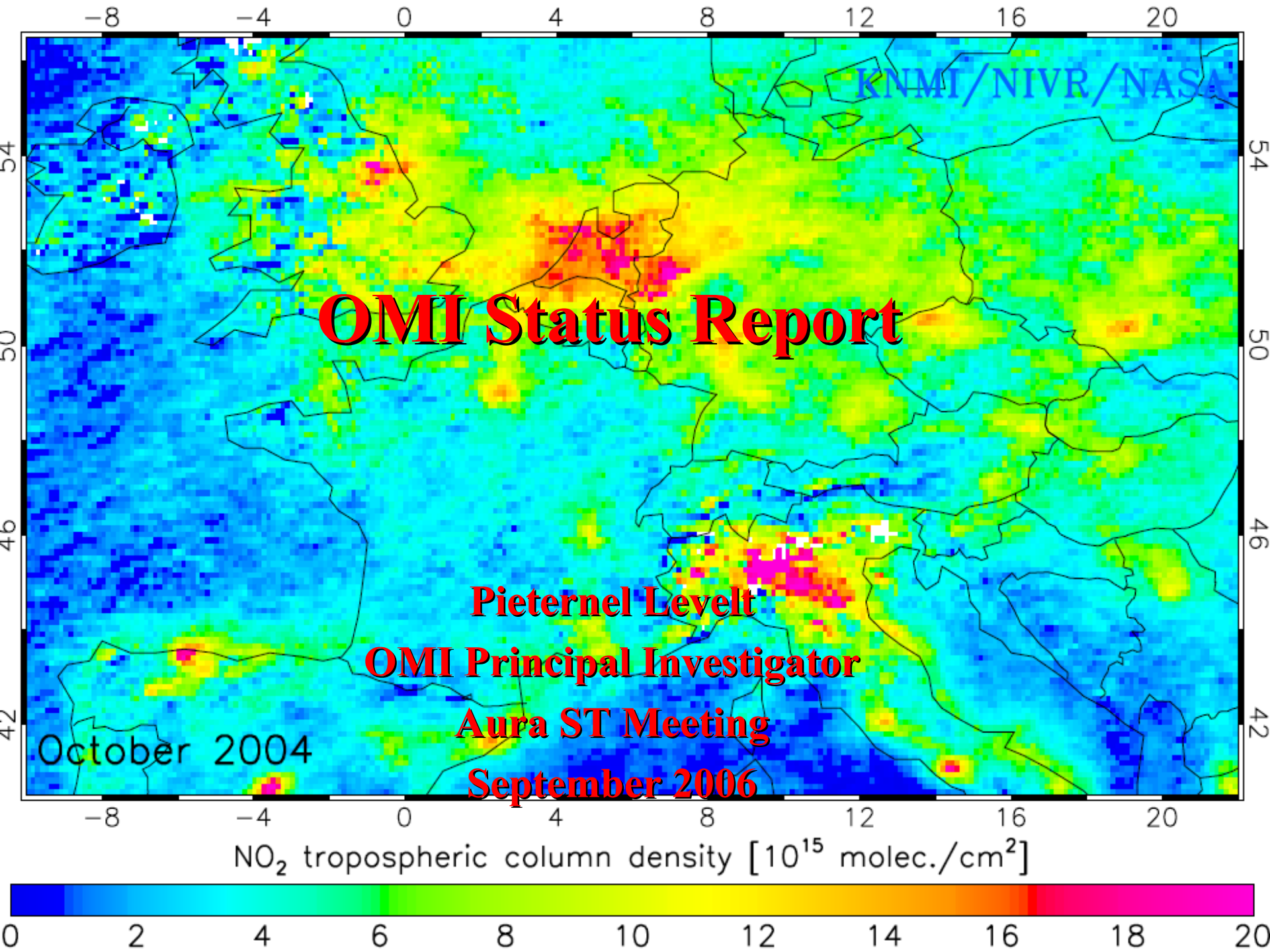

KNMI/NIVR/NASA
OMI Status Report
Pieternel Levelt
OMI Principal Investigator
Aura ST Meeting
September 2006
October 2004
−8
−4
0
4
8
12
16
20
54
50
46
42
NO2 tropospheric column density [10^15 molec./cm^2]
0
2
4
6
8
10
12
14
16
18
20

International OMI Team

International OMI Science team

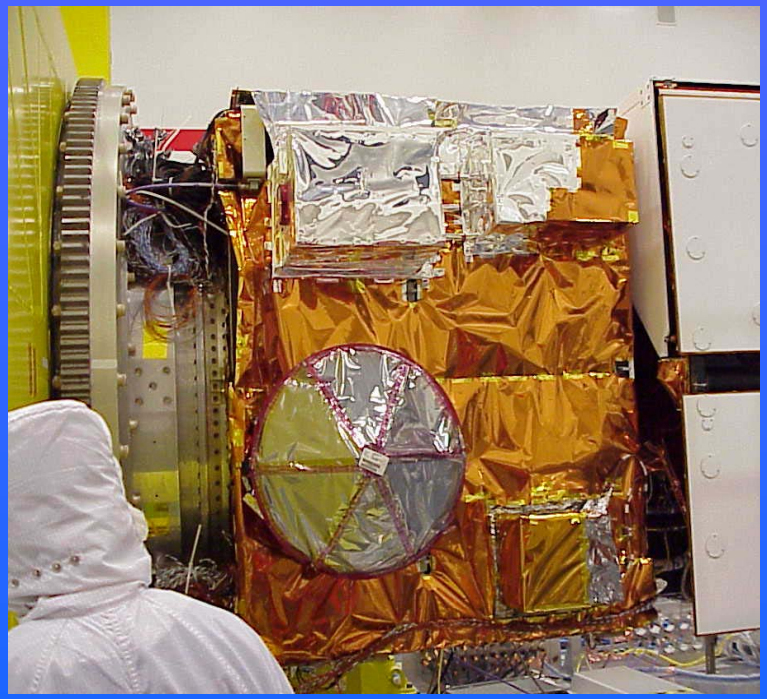
- PI: P.F. Levelt
- dep.PI: P. Veefkind
- co-PI J.Tamminen
- US ST Leader: P.K. Bhartia
- …. And about 60 - 80 scientists

Industry

- Dutch: DS, TNO-TPD, SRON
- Finnish: VTT, Patria
- USA: Northrop GES USA

Dutch, Finnish and US Space Agencies

- NIVR, FMI and NASA



Thanks to OMI Science Team !

PK Bhartia	US OMI Team Leader
Albert Fleig	Data processing
Richard McPeters	Dept. TL science
Lawrence Flynn	Ozone algorithm
Jack Fishman	Trop. Ozone algorithm
Kelly Chance	Trace gas algorithm
James Gleason	NO2 algorithm
Joanna Joiner	Cloud algorithm
Omar Torres	Aerosol algorithm
George Mount	Instrument calibration
Donald Heath	Instrument calibration
Richard Cebula	Instrument calibration
Arlin Krueger	SO2 algorithm
Derek Cunnold	Ozone validation
Charles Trepte	Aerosol validation
Ivanka Štajner	Data assimilation
Stanley Sander	NO2 validation
Ernie Hilsenrath	US co-PI
Johanna Tamminen	Finnish co-PI
Gilbert Leppelmeier	Retiring Finnish co-PI
Anssi Mälkki	Finnish Program Leader
Esko Kyrö	Validation
Aapo Tanskanen	Surface UV irradiance
Seppo Hassinen	OMI VFD products

Pieternel Levelt	OMI-Principal Investigator
Bert van den Oord	Deputy PI
Pepijn Veefkind	Lead Algorithm WG
Marcel Dobber	Lead Calibration WG
Ruud Dirksen	Instrument calibration.
Robert Voors	Instrument calibration
Quintus Kleipool	Instrument calibration
Johan de Haan	Cloud algorithm
Mark Kroon	OMI Validation
Ellen Brinksma	Validation + NO2 algorithm
Folkert Boersma	NO2 algorithm + validation
Jacques Claas	Lead OMI Operations
René Noordhoek	OMI scientific secretary
Wim Som de Cerff	OMI data processing
Henk Eskes	OMI key ST member
Roeland van Oss	OMI key ST member
Piet Stammes	OMI key ST member
Hennie Kelder	OMI key ST member
Gerrit de Leeuw	OMI key ST member
Claus Zehner	OMI key ST member
Frank Dentener	OMI key ST member
Ilse Aben	OMI key ST member
Ivar Isaksen	OMI key ST member
Ulrich Platt	OMI key ST member
Didier Hauglustaine	OMI key ST member
Paul Simon	OMI key ST member

Instrument and Operations

- **Instrument**
  - Instrument is thermally stable
  - no signs of optical degradation
  - CCD degradation will be (mostly) corrected for in next reprocessing set
  - OMI had a Folding Mirror Anomaly on Feb 28, 2006 (see below)

- **Operations**
  - OMI operations is almost flawless (only 4 days of data loss)
  - **FMM anomaly** was investigated and is off the table. OMI mechanisms will be operated differently (currently implemented). The anomaly resulted in:
    - 3 days of data loss (February 28, March 1 & 2)
    - March 3 – June 12: Science (Earth and dark) data taken, no cal.meas.
    - June 12 onward: nominal operations
  - The OMI instrument settings have been optimized for the ozone hole season to prevent saturation in the UV
  - An extra calibration meas. was implemented to determine the non-linearity of the CCD.

In-flight calibration and level 1b

- **In-flight Calibration and level 1b**
  - Extensive OMI in-flight calibration program
  - Calibration data gap :March 3 - June 12 (FMM anomaly)
  - Level 1b provisional released: September 2006 !

- **Striping correction and improved straylight correction for ECS-3 reprocessing (level 1b 0.9.18 and OPF 32):**
  - Updated Level 1b software (v 0.9.18) (straylight)
  - New type Calibration key data file : time-dependent! (TDOPF (OPF32))
    - include time dependent corrections for background and RTS (striping)
    - straylight and radiometric corrections
  - Level 1b (v 09.18) and the time-dependent OPF form the basis for our reprocessing effort starting end of January 2007.
  - Level 1b product planned public release is planned for the ECS 3 collection (currently Jan. 2007) -gradual release of data.

Ground segment (1)
Reprocessing (ECS 3 collection)

- L1b software (v o.9.18): end of September
- L2 PGE's : December 22, 2006

  run new L1b software in test stream, evaluate impact on L2 data and update L2 PGE's (if needed) : Oct & Nov: evaluation time for level 2 developers!
- TDOPF : mid January 2007
- DAAC/DISC:

  prepare for ECS2 to ECS3 transition (S4PA!!), including end-to-end testing: early nov06

Note:

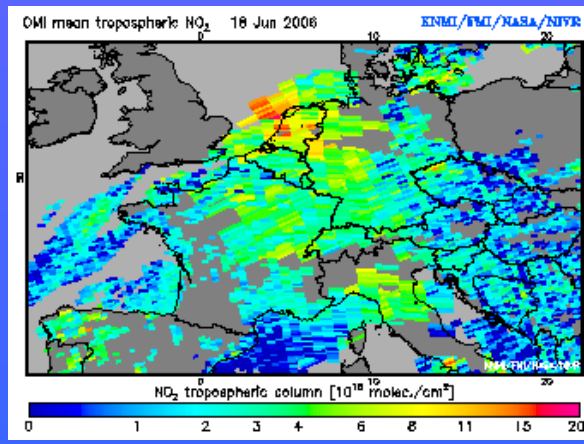
- L0 -> 1b data will be reprocessed (with TDOPF) for ECS3 till reprocessing catches up with forward processing (without TDOPF) for ECS2
- turn-off ingest of ECS2 data: date is TBD

Only when all these milestones are met reprocessing the OMI L0 -> 1b data can start end of January 2007

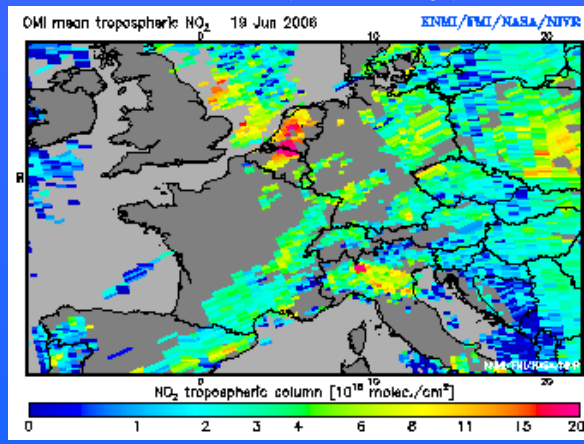
Ground segment (2)

- **Ground system**
  - SIPS and ODPS performance is as expected
  - NRT system O3 and NO2 since January 2006: O3 data to NOAA and ECMWF; NO2 at KNMI website
  - VFD system is operational since March 2006
  - Reprocessing for ECS collection 3 will start in Jan.2007

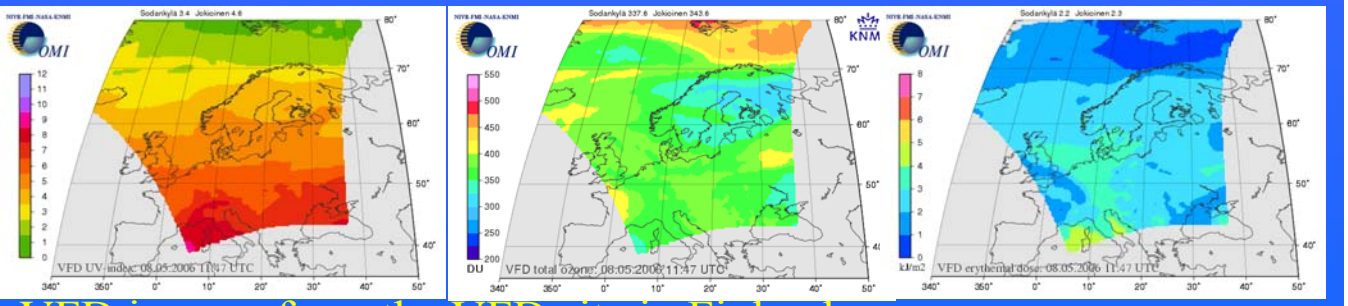
June 18 (Sunday)



June 19 (Monday)



UV index | Total Ozone | Erythemal Dose

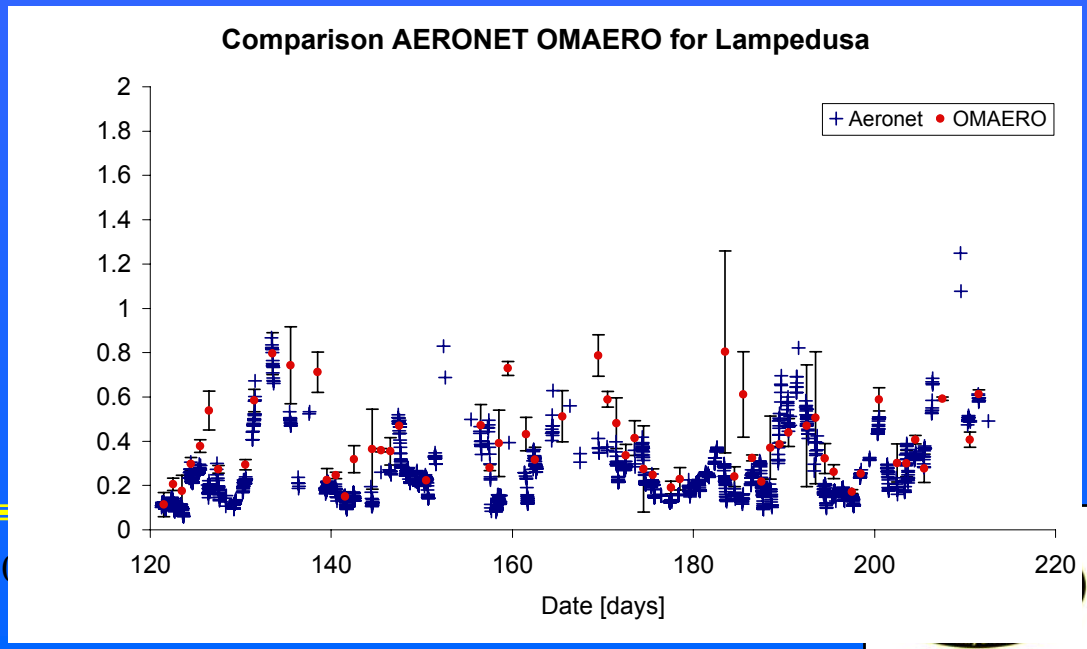


VFD images from the VFD site in Finland:
Tanskanen et al.
http://omivfd.fmi.fi/index_eng.html

NRT images OMI NO2
KNMI TEMIS and OMI websites;
van der A, Boersma, Eskes, Veefkind

Level 2 Algorithm Status (provisional)

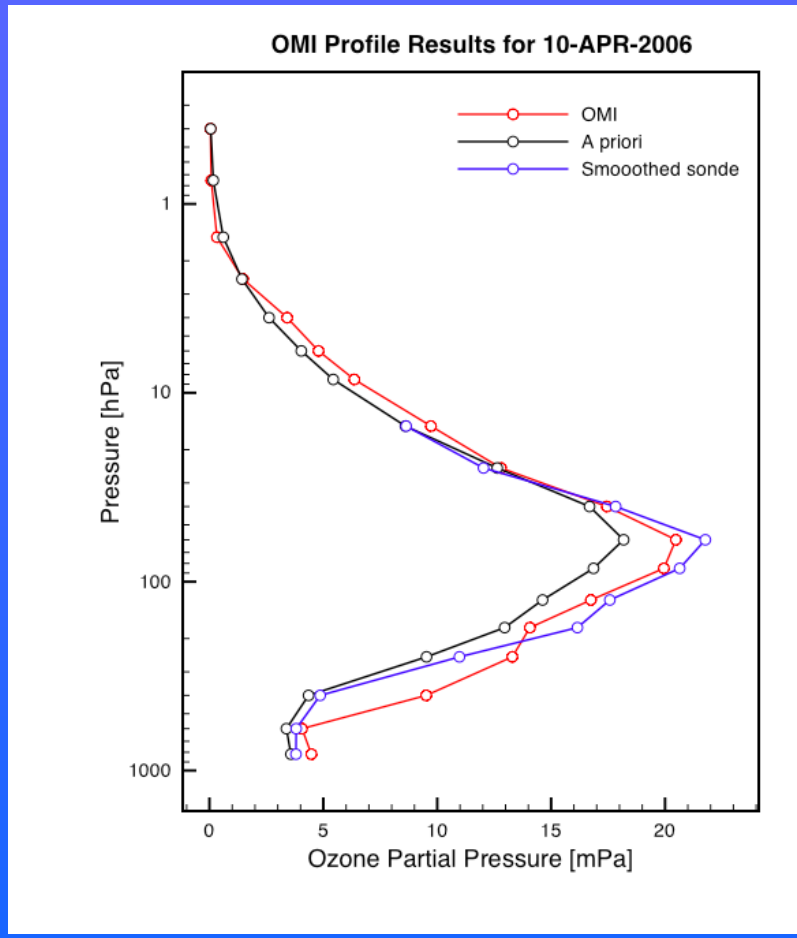
- All products are provisionally released, except for O3 profile
- Ozone profile provisionally release is planned for October.
- Multi-wavelength aerosol product (OMAERO) provisional release is planned for November.



Veefkind, Veihelman
KNMI

Level 2 Algorithm Status (public)

- O2-O2 Cloud and Ozone DOAS products (v1.0.1) have been publicly released in June
- NO2 product has been publicly released in September
- UV Aerosol and UV-B will be publicly released this month
- HCHO, BrO and SO2 public release is planned in October
- OClO public released in November
- O3 profile and level 1b will be publicly released after reprocessing (ECS-3)



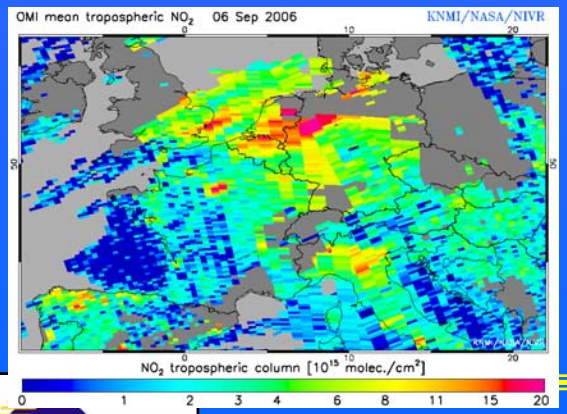
Courtesy De Haan
Presentation: de Haan & Veihelman, Thursday

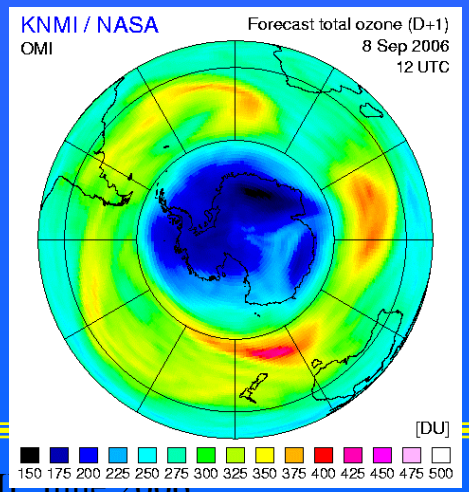
Status of OMI Data Products

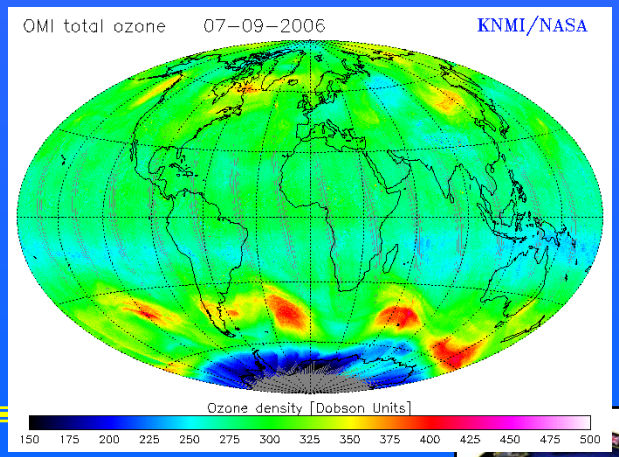
Product	Provisional release	Validated Stage 1 release (Public)	Validation Status
- Level 1B	Released	February 2007 (ECS-3)	
- Total Column Ozone (TOMS)	Released	Released	
- Total Column Ozone (DOAS)	Released	Released	
- Aerosol[1]	Released	*September 2006*	
- NO_2 total and trop. column	Released	Released	
- Cloud Height (O2-O2)	Released	Released	
- Cloud Height (Raman)	Released	Released	
- Surface UVB	Released	*September 2006*	
- HCHO	Released	October 2006	
- SO_2	Released	October 2006	
- BrO	Released	October 2006	
- OClO	Released	November 2006	
- O_3 Profile	October 2006	March 2007 (ECS-3)	

Near-real Time Data Products

- On www.temis.nl the following near-real-time information can be found:
  - Images of tropospheric NO_2
  - Images of total column ozone
  - Assimilated and forecasted total ozone (data will be released soon!)
- The near-real-data will be put on this site in the coming months.
- O3 data (TOMS and DOAS) are delivered to NOAA and ECMWF
- Serious plans for a NRT SO2 product







Validation

- **Validation: extensive validation program:**
  - NASA aircraft campaigns
  - ESA/NIVR/KNMI AO ***(Kroon, Thursday)***
  - NASA NRA
  - Ground based campaigns
    - DANDELIONS 1 ***& 2***
    - SAUNA campaign

- **OMI Validation Priorities:**
  - NO2 (polluted conditions)
  - O3 (polluted conditions and high solar zenith angle, snow, clouds)
  - Aerosols
  - HCHO, SO2 and other trace gases

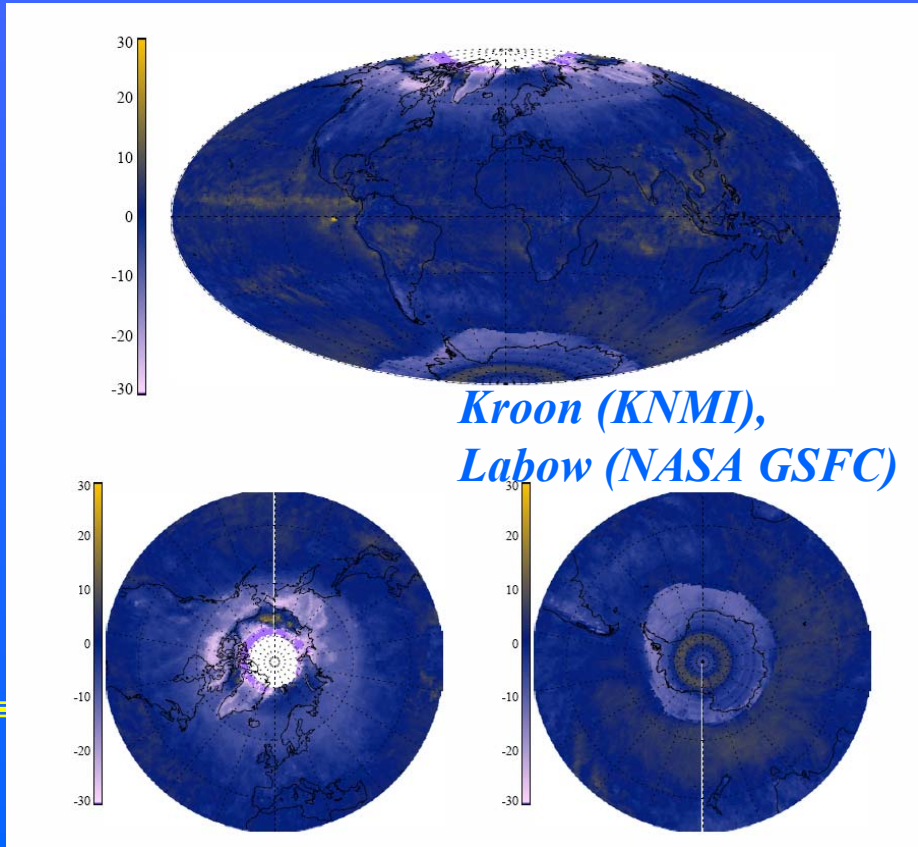
Total ozone: Chiou, Labow, Thursday

$<>= -0.45$ DU

$\sigma = 11.3$ DU

$\gamma = -1.66$

OMI TOMS V8 - DOAS v1.0.1
Total O3 Column



Kroon (KNMI), Labow (NASA GSFC)

NO2 – 2nd DANDELIONS Campaign

KNMI, NASA	OMI, SCIAMACHY
RIVM	NO2 lidar, backscatter lidar, NO_2 ground monitors
BIRA-IASB	MAXDOAS, Mini MAXDOAS
IUP Heidelberg	MAXDOAS (three directions)
IUP Bremen	MAXDOAS
KNMI	Mini MAXDOAS, ozone sondes, radio sondes
TNO	Sun photometers, volatility system, aethalometer, nephelometer, etc.

Results of the first campaign yielded, e.g. :
NO_2 profiles 0-2.5 km by lidar and MAXDOAS
MAXDOAS system comparisons & accuracy assessments

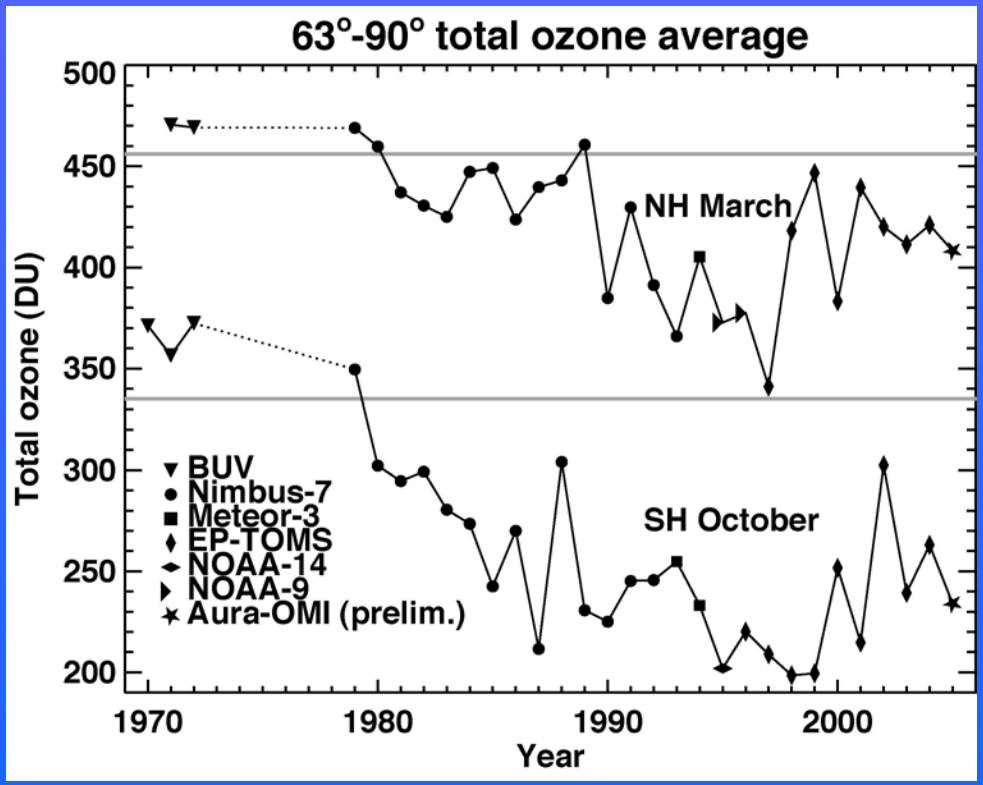



2941 - Validation of SCIAMACHY and OMI NO2 and aerosol data using Dutch ground based measurements. Dr. Pieternel F. Levelt, KNMI, De Bilt, The Netherlands

OMI Highlights
2004, 2005 and 2006

OMI data delivered to IPCC

First OMI data delivered to IPCC
OMI data used in WMO Antarctic O3 report, 2005/2006 winter



Average column ozone pole ward of 63 latitude in the springtime of each hemisphere (March for the NH and October for the SH), in Dobson units, based on data from various satellite instruments as indicated. Data point from the Ozone Monitoring Instrument (OMI) is preliminary. Figure is updated from Newman et al. (1997)

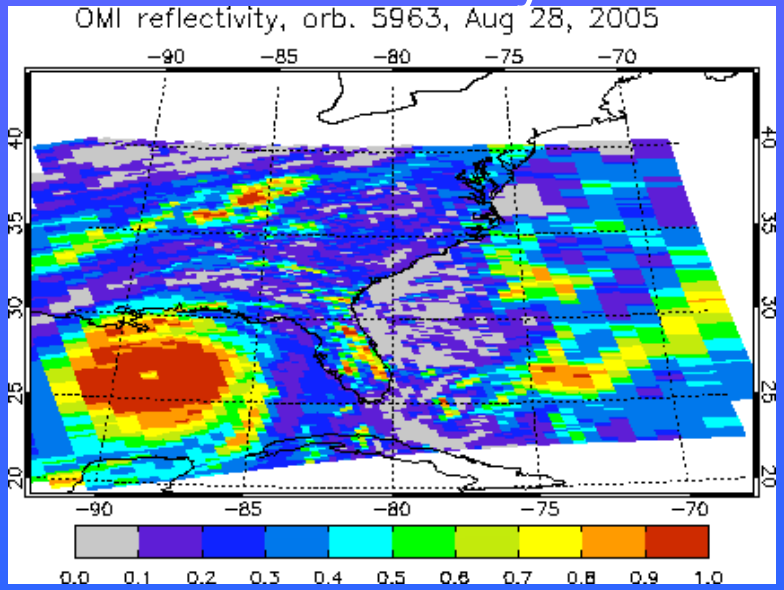
IPCC/TEAP Special Report: Safeguarding the ozone layer and the global climate system: *Issues related to the hydrofluorocarbons and perfluorocarbons, Summary for Policy Makers*, WMO/UNEP, 2005.

OMI's view of Katrina

OMI effective cloud pressure: UV channels sensitive to Raman scattering see through high cirrus to lower water clouds with band structure

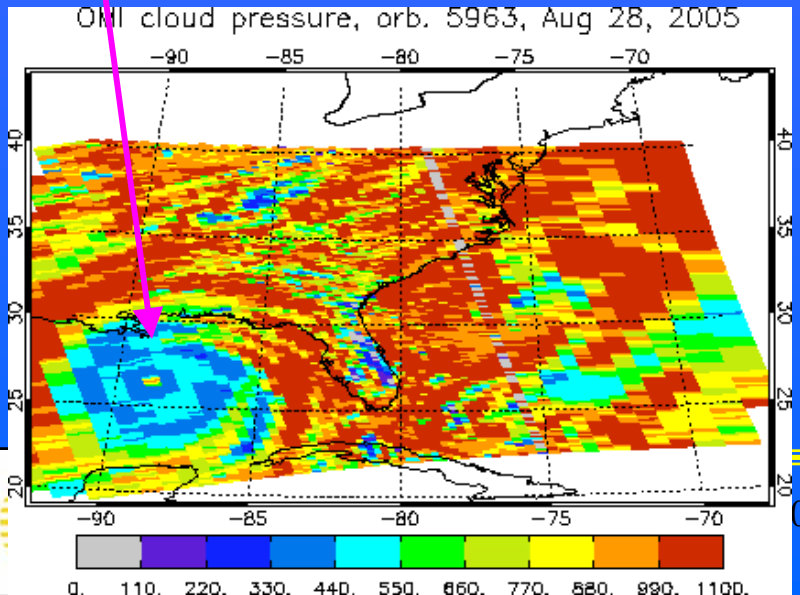
Joanna,Vassilkov et al., GRL, 2006

OMI reflectivity

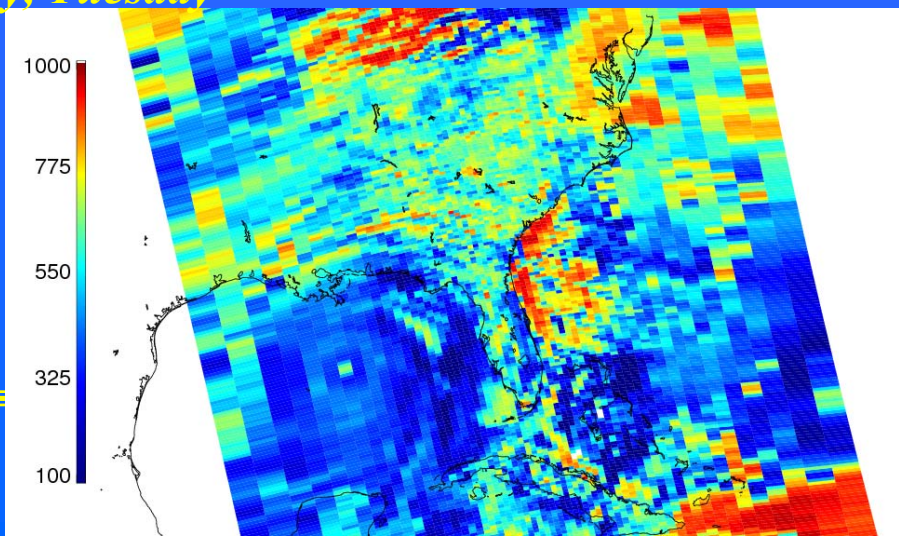


OMI cloud pressure: O2-O2 DOAS Retrieval; senses deeper in cloud than Raman

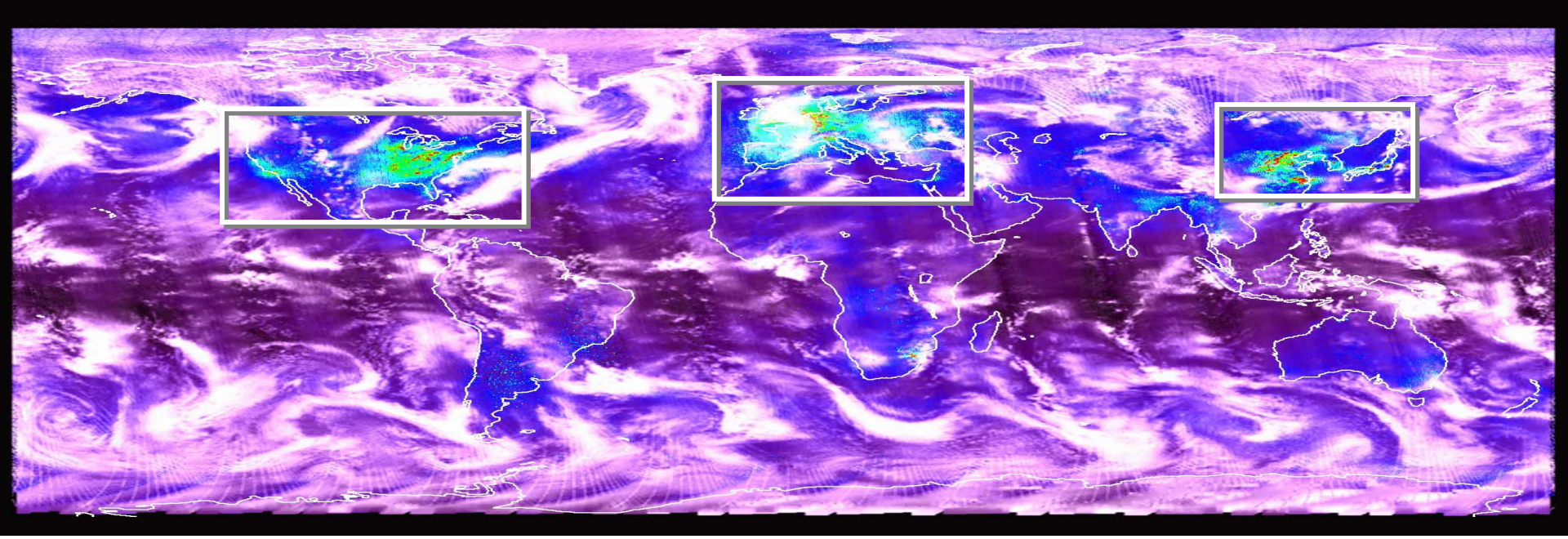
Sneep, de Haan, Stammes et al.



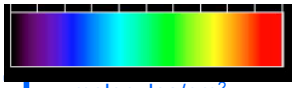
Vasilkov, poster, Monday, Tuesday



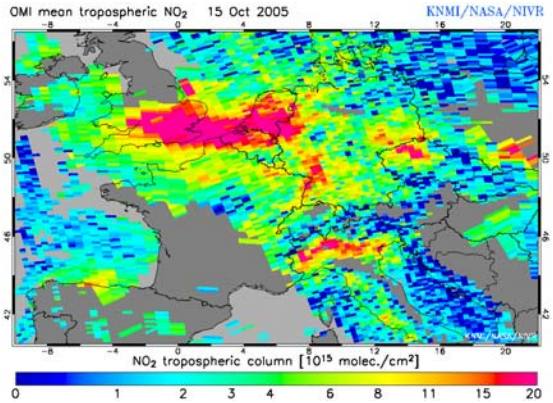
006



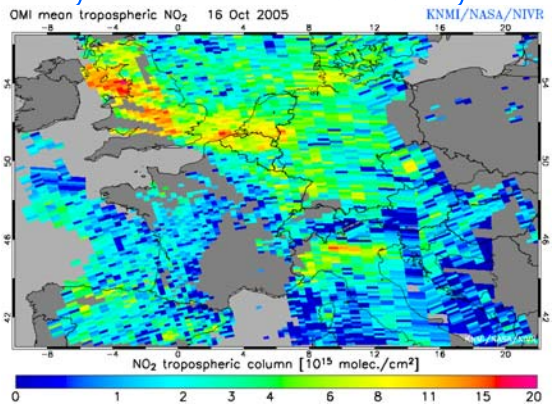
OMI NO_2 Images for April 15, 200



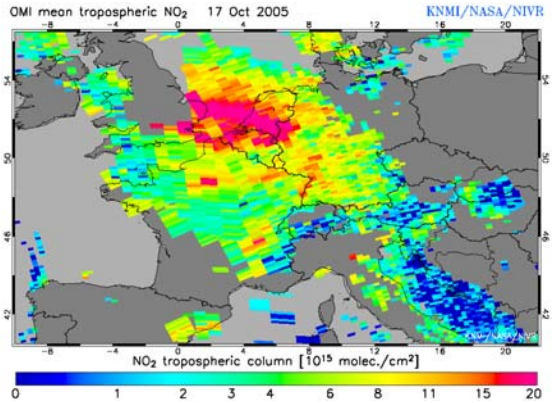
Glaeson , Veefkind et al. , Talk by Gleason, Thursday



Saturday 15 October



Sunday 16 October



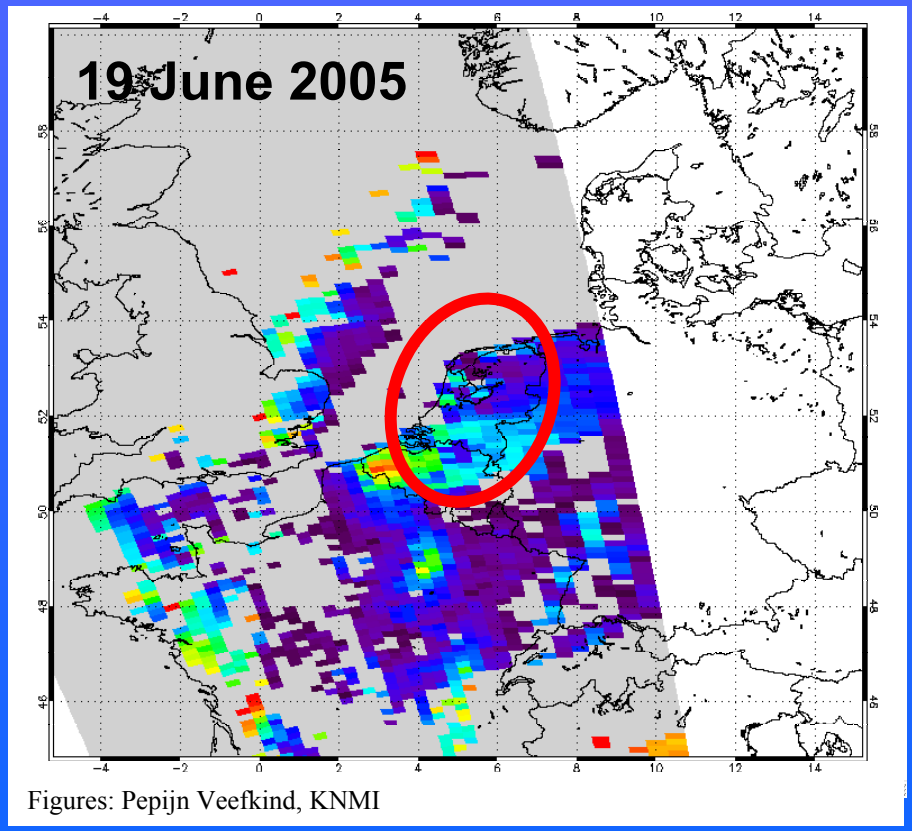
Monday 17 October

OMI NRT NO2; Veefkind, Eskes, Boersma. Van der A, KNMI

Talk by Boersma, Monday

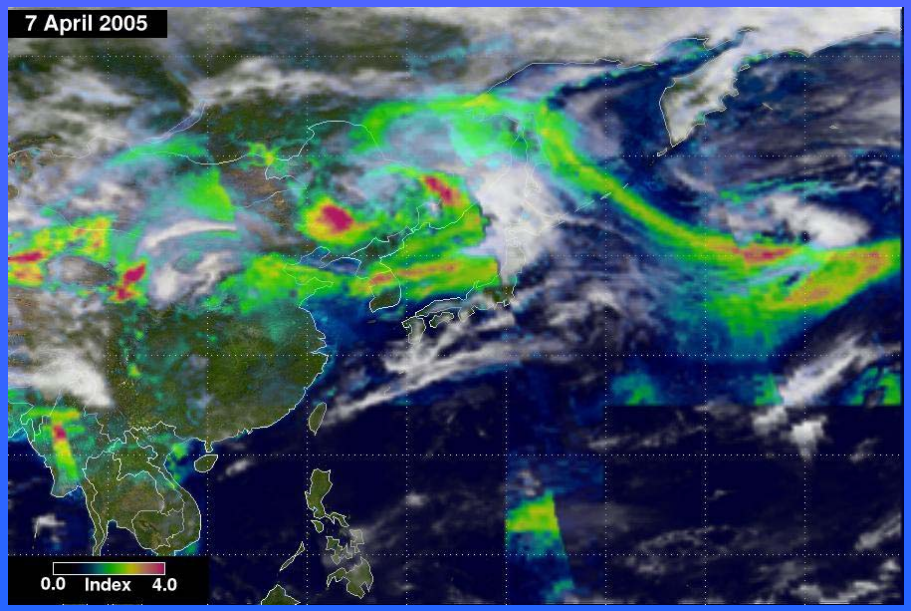
Aerosol

Multiwavelength algorithm



Figures: Pepijn Veefkind, KNMI

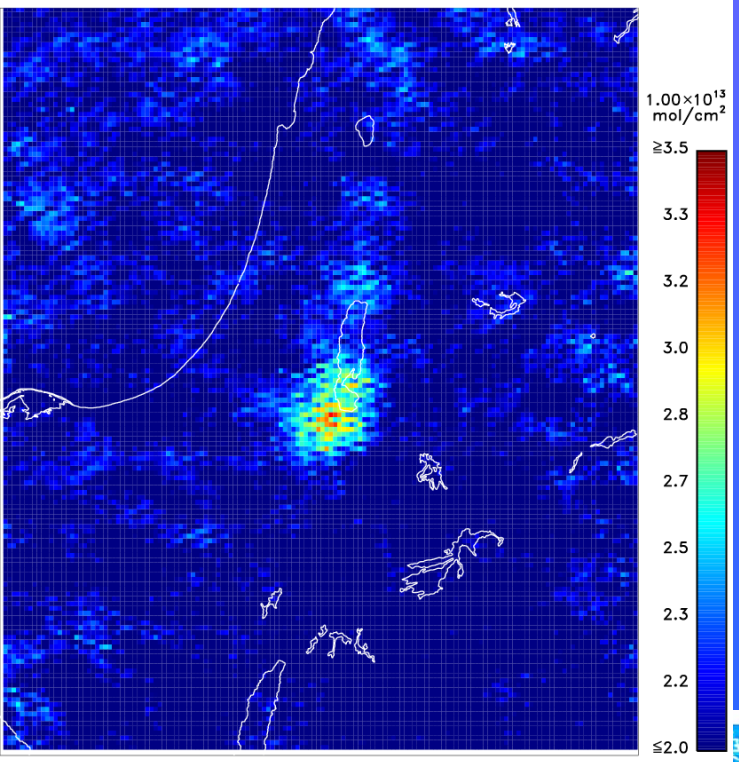
UV algorithm

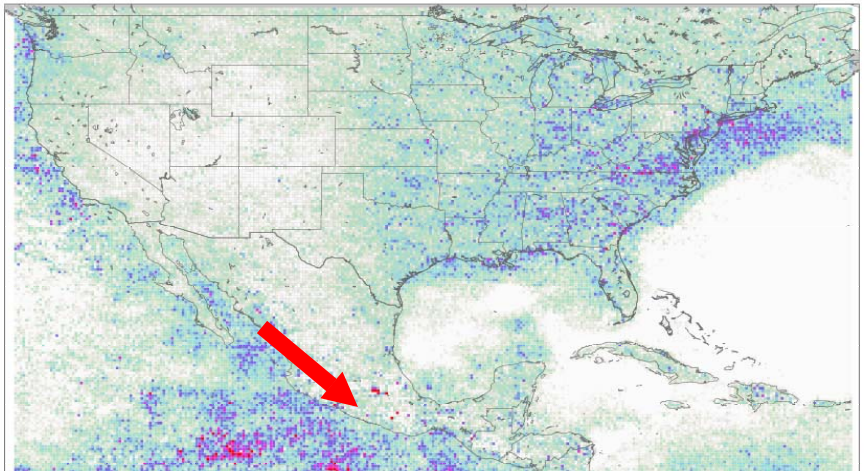


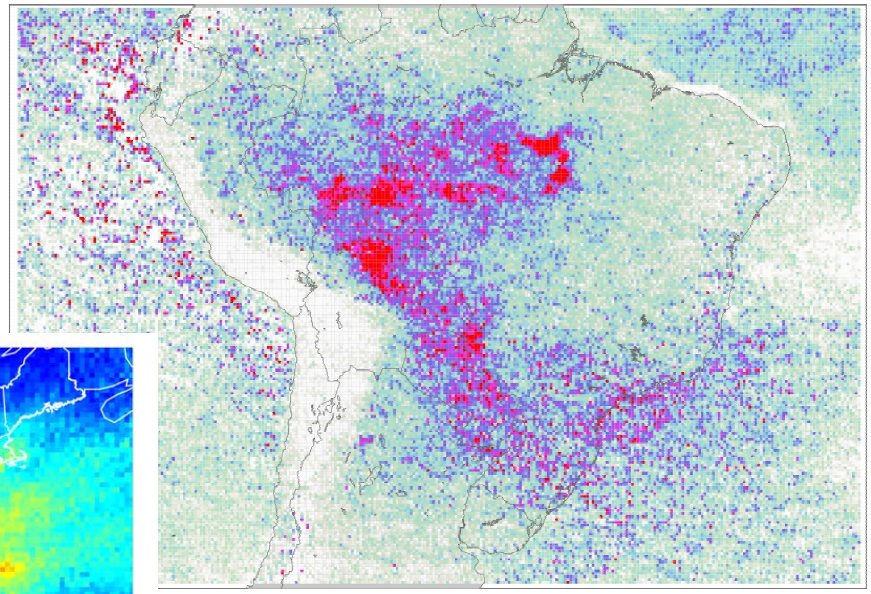
Torres, NASA GSFC

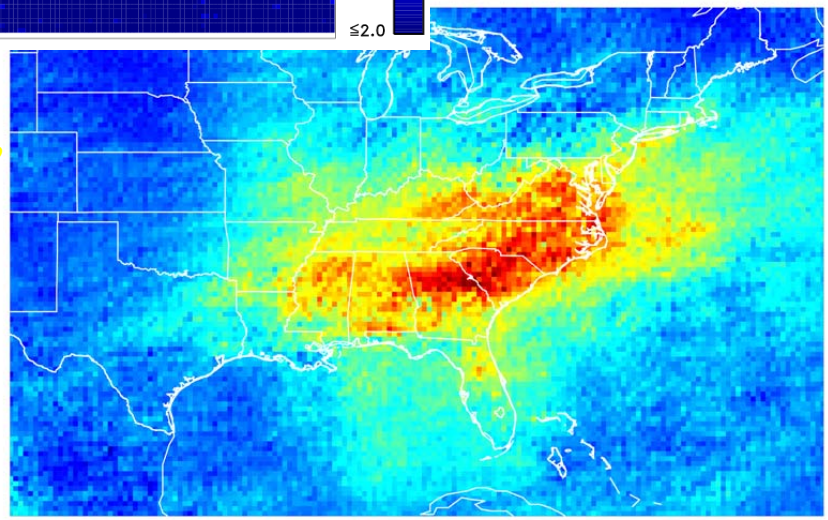
Veefkind, Curier, De Leeuw, KNMI and TNO-FE

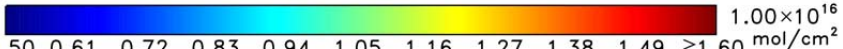
CHO-CHO, HCHO, BrO











Talk by Jacob, Monday

nas Kurosu, Smithsonian Astrophysical Observatory, Boston, USA

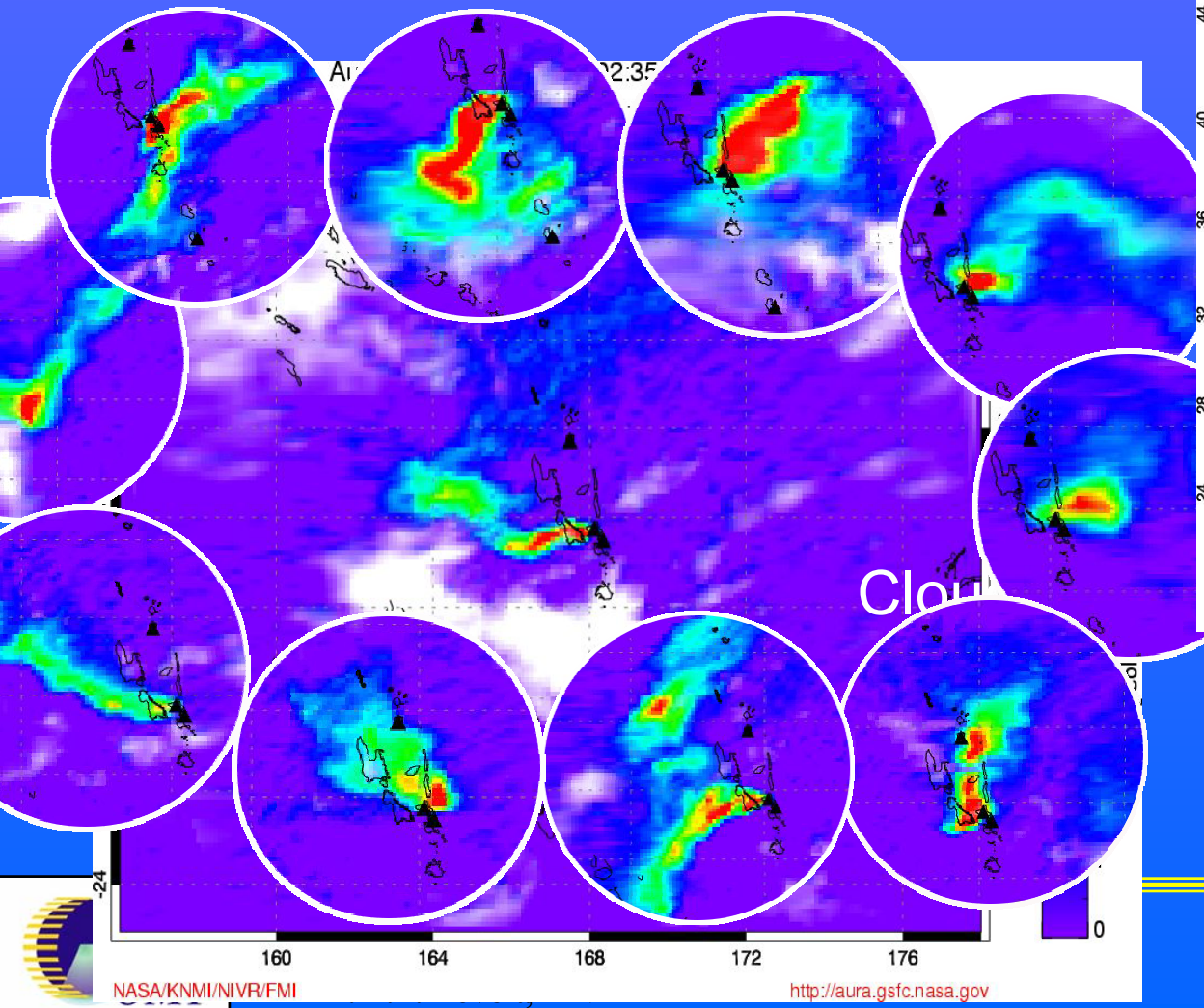
Kurosu and Chance, Harvard

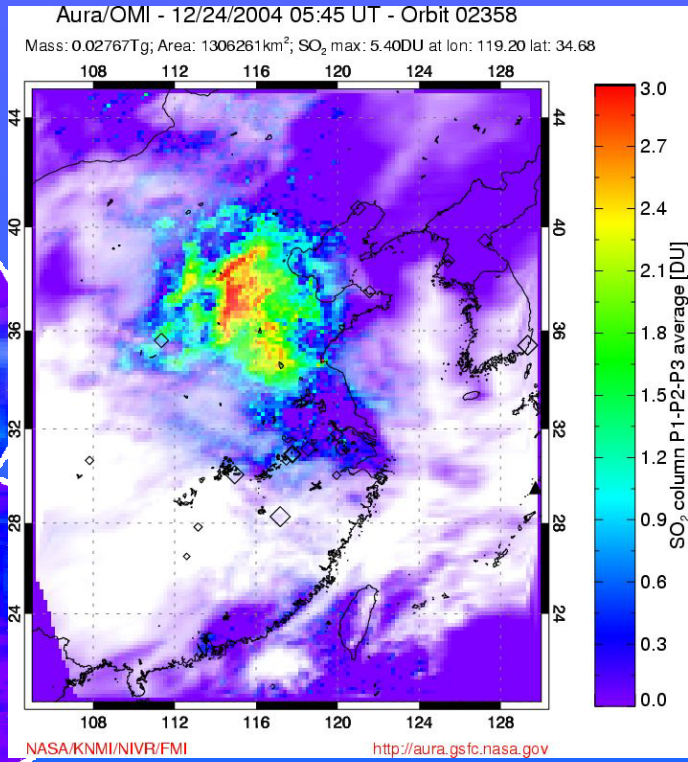
OMI

EOS AURA
Chemistry & Climate

Ambrym (Vanuatu) SO_2 plume Feb 20, 2005: aviation control

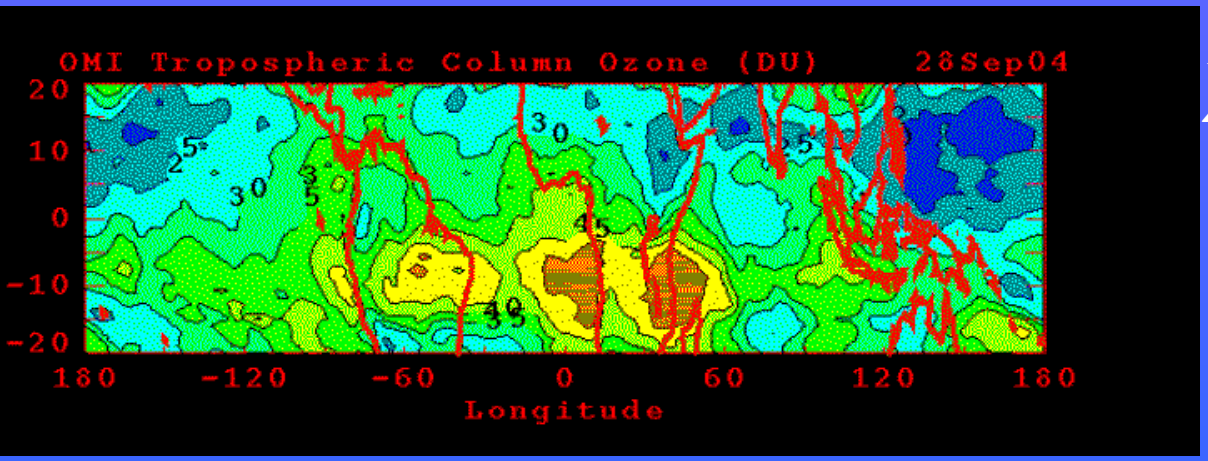
Talk by Carn, Friday





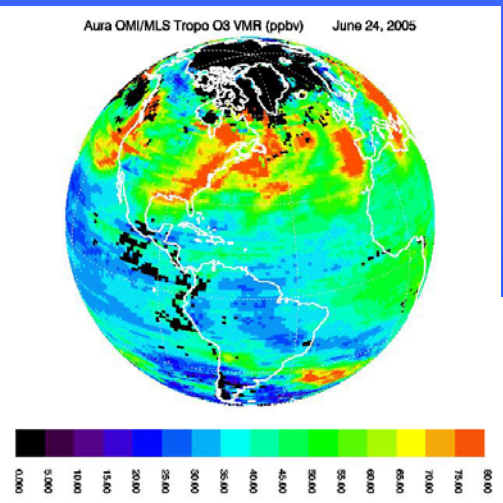
Krotkov, Carn, Krueger,
NASA GSFC,
University of MAryland

Tropospheric Ozone (scientific product)

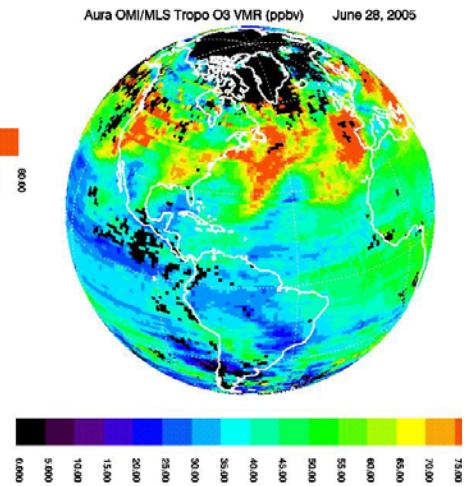


Trop.Ozone cloud slicing method, Ziemke et al.

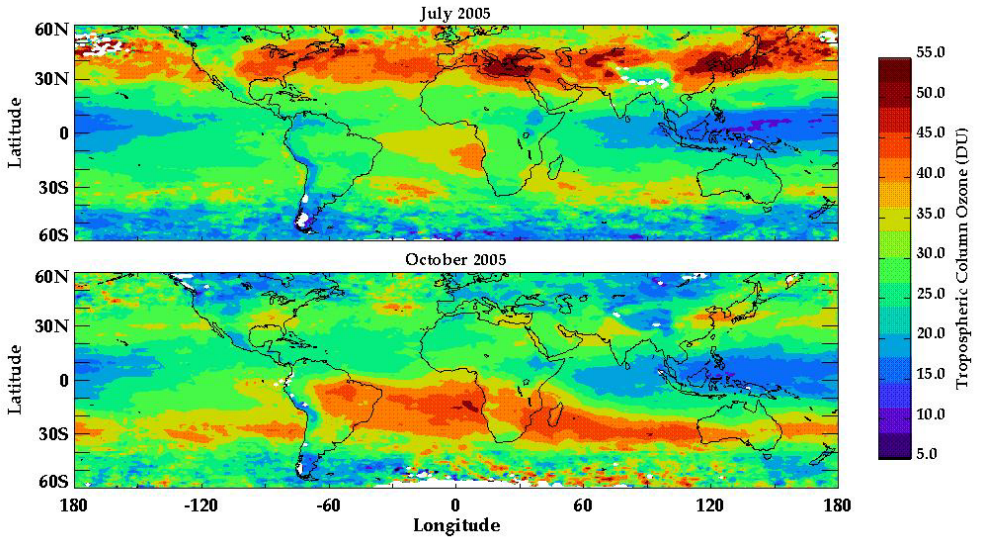
Several presentations & posters on trop O3, a.o. Schoeberl Tuesday, Stajner, Friday; Worden, Friday



MLS/OMI tropospheric ozone, Monthly average July and October 2005, Ziemke et al., JGR 2006



24 and 28 June 2005



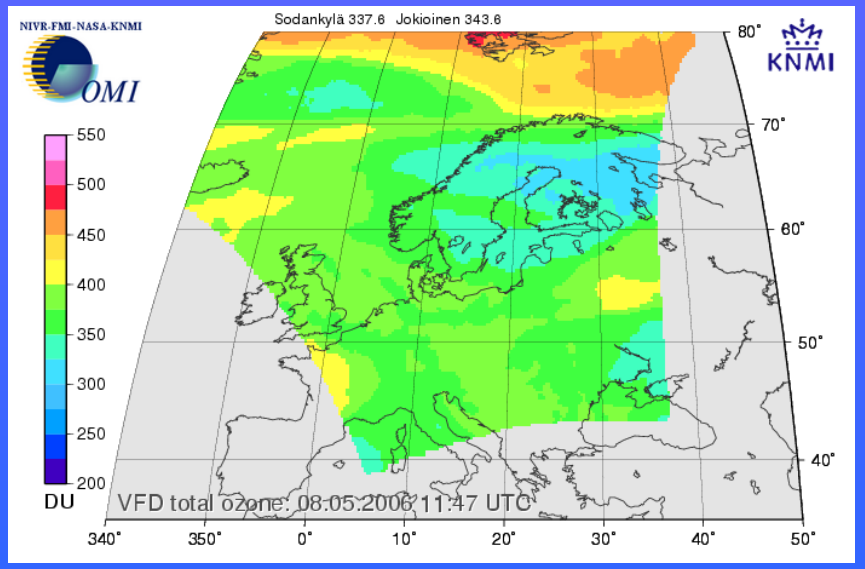
OMI ST

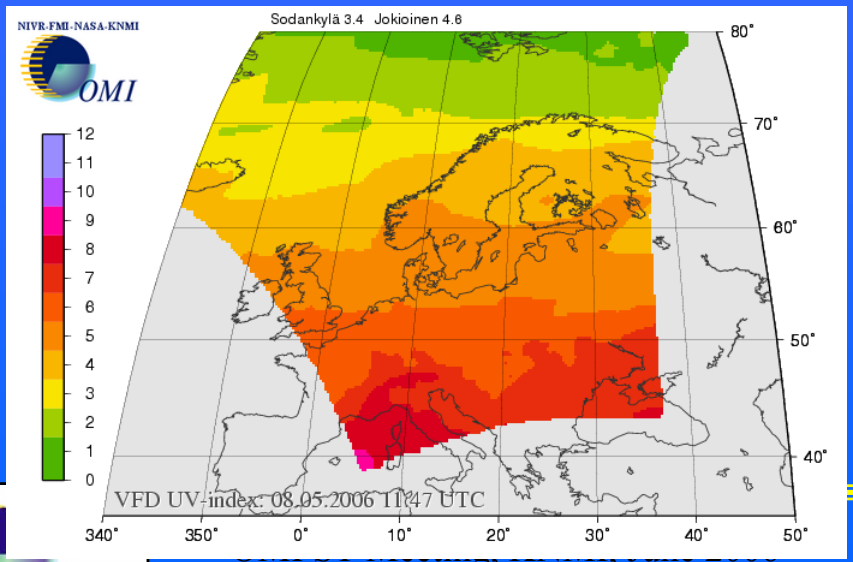
Dr. P.F. L

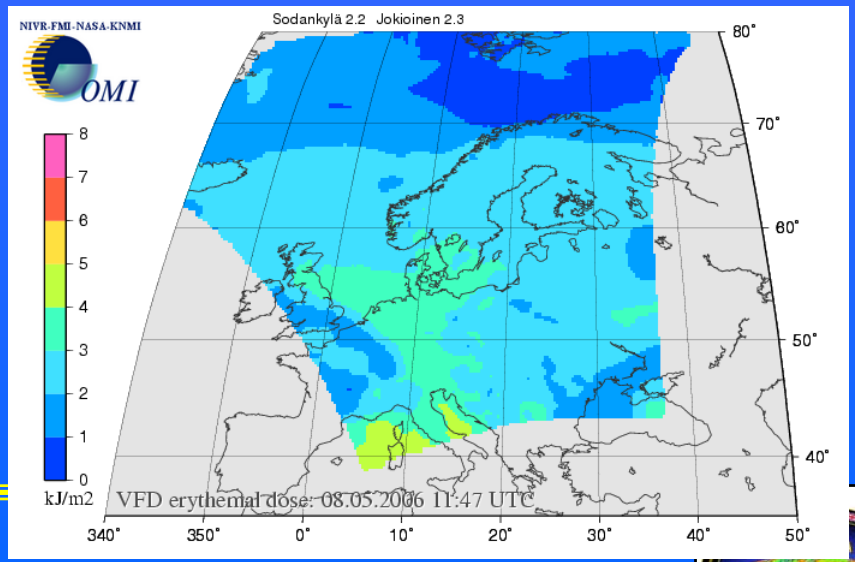
OMI Very-Fast-Delivery has been operational since March 2006

OMI data is received by Direct Broadcast in Sodankylä and is processed immediately after each overpass of the Aura satellite. Distribution plots for total column ozone, UV Index and Erythemal daily dose are published within 30 minutes after the overpass at

http://omivfd.fmi.fi/index_eng.html







Ozone Monitoring Instrument

Data Access

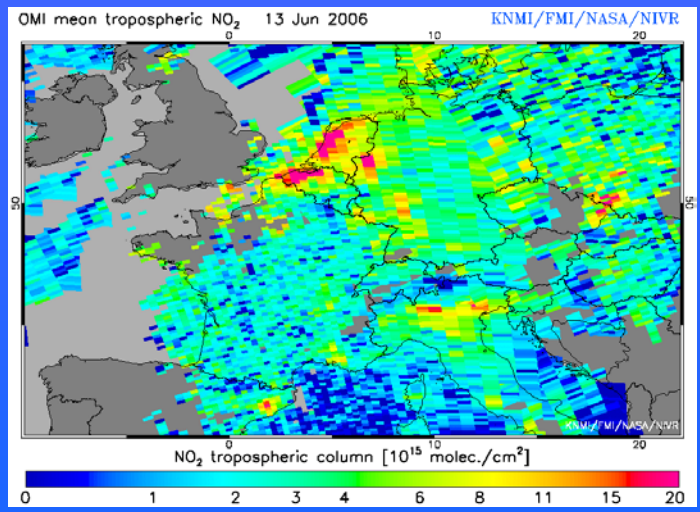
- Standard products: Distributed Active Archive Center of NASA-GSFC Earth Sciences http://disc.gsfc.nasa.gov/Aura/OMI
- Near-real-time products(images): http://www.temis.knmi.nl http://www.knmi.nl/omi
- Very-fast-delivery products: http://omivfd.fmi.fi/index_eng.html
- For validation: http://avdc.gsfc.nasa.gov

Conclusions

- OMI is the first of the new generation space borne spectrometers that enables daily AQ measurements from space
- OMI is operated successfully and works according to expectations
- OMI off-line standard data all public available in 2007
- Reprocessing for ECS 3 starts end of January 2007
- Interest in validation:please contact us!

When using public OMI data:
contact OMI ST representatives
And read read-me files !!!

OMI NO2, June 13, 2006
courtesy Pepijn Veefkind, Henk Eskes, Folkert Boersma, Ronald van der A



www.knmi.nl/omi
http://eos-aura.gsfc.nasa.gov/

backup